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Henry

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(54) **APPARATUS AND METHOD FOR A BALL JOINT FITTING ASSEMBLY**

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F16L 41/18 (2006.01)

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CPC **F16L 5/025** (2013.01); **F16L 41/18**
(2013.01); **F16L 2201/30** (2013.01)

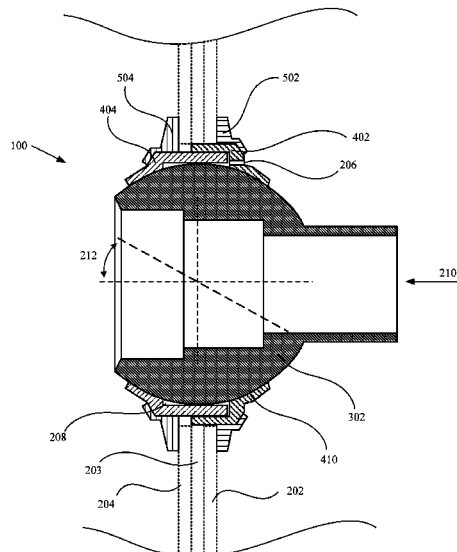
(58) **Field of Classification Search**
USPC 285/141.1, 139.1, 139.2, 138.1, 184,
285/261

See application file for complete search history.

(57) **ABSTRACT**

An apparatus for extending a pipe through a wall. The apparatus includes a ball joint through which at least one pipe extends, an inner pipe, which extends through the ball joint and through which a fluid material may transfer, a housing unit, which substantially surrounds the ball joint and comprises resin bonding surfaces that seal the housing unit to the ball joint, and a flange unit, which affixes to the housing unit and comprises resin bonding surfaces that seal the flange unit to a wall. The angle between the longitudinal axis of the inner pipe and a line orthogonal to the wall through which the pipe extends is in the range of between about 0 and 20 degrees.

19 Claims, 6 Drawing Sheets



100

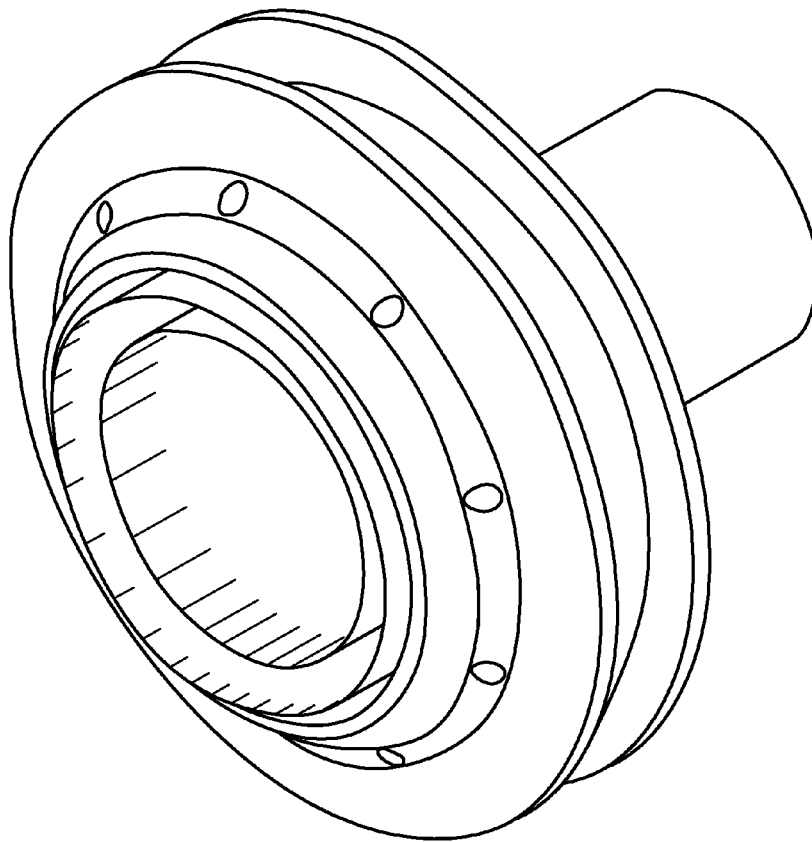


FIG. 1

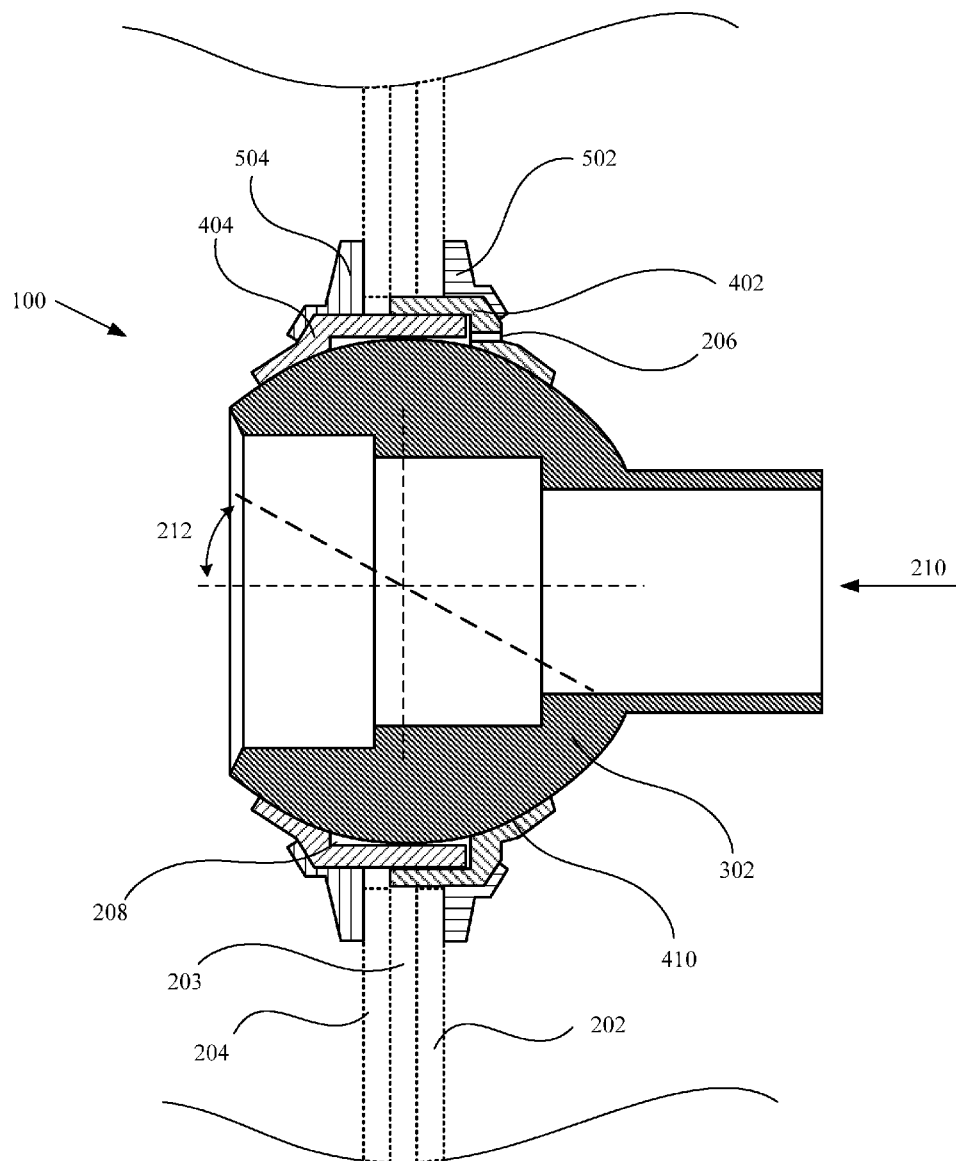


FIG. 2

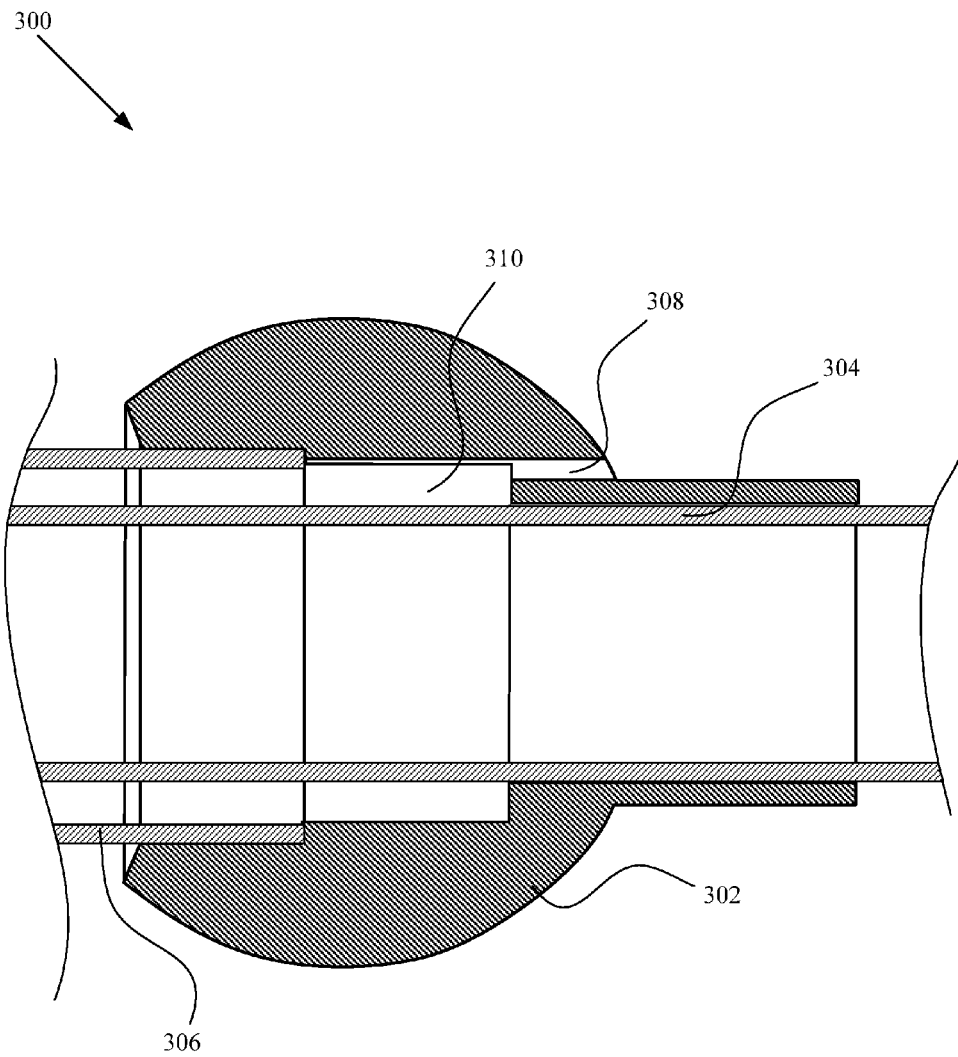


FIG. 3

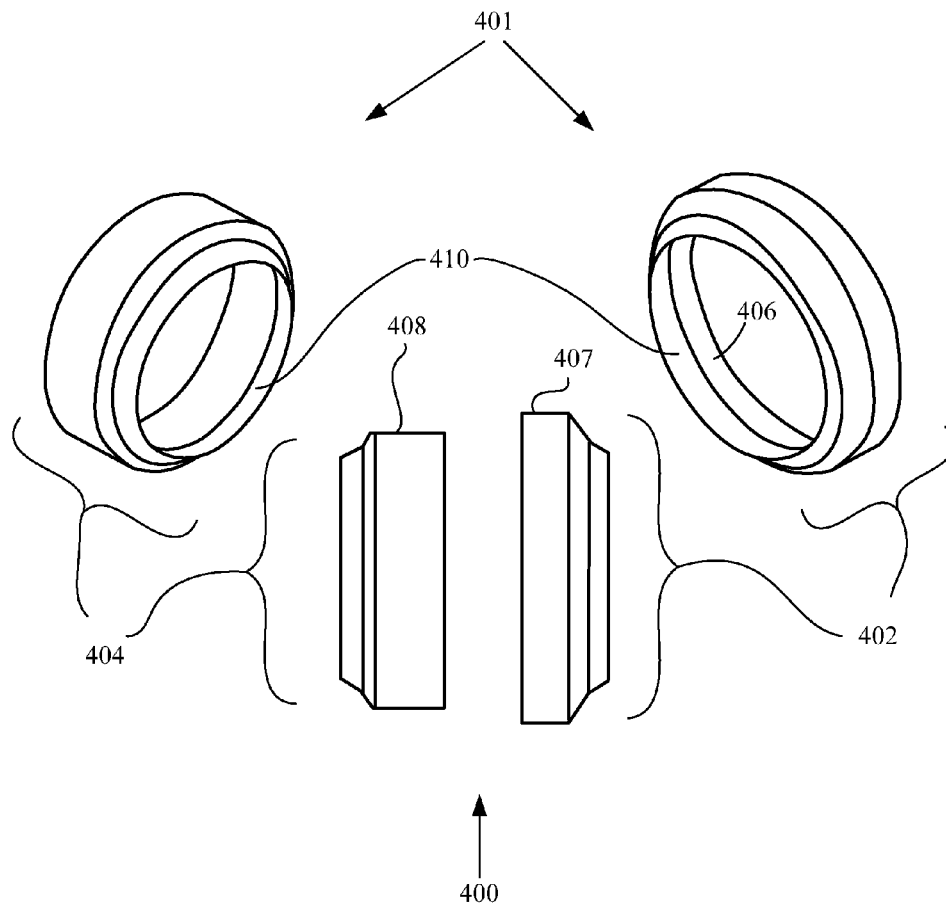


FIG. 4

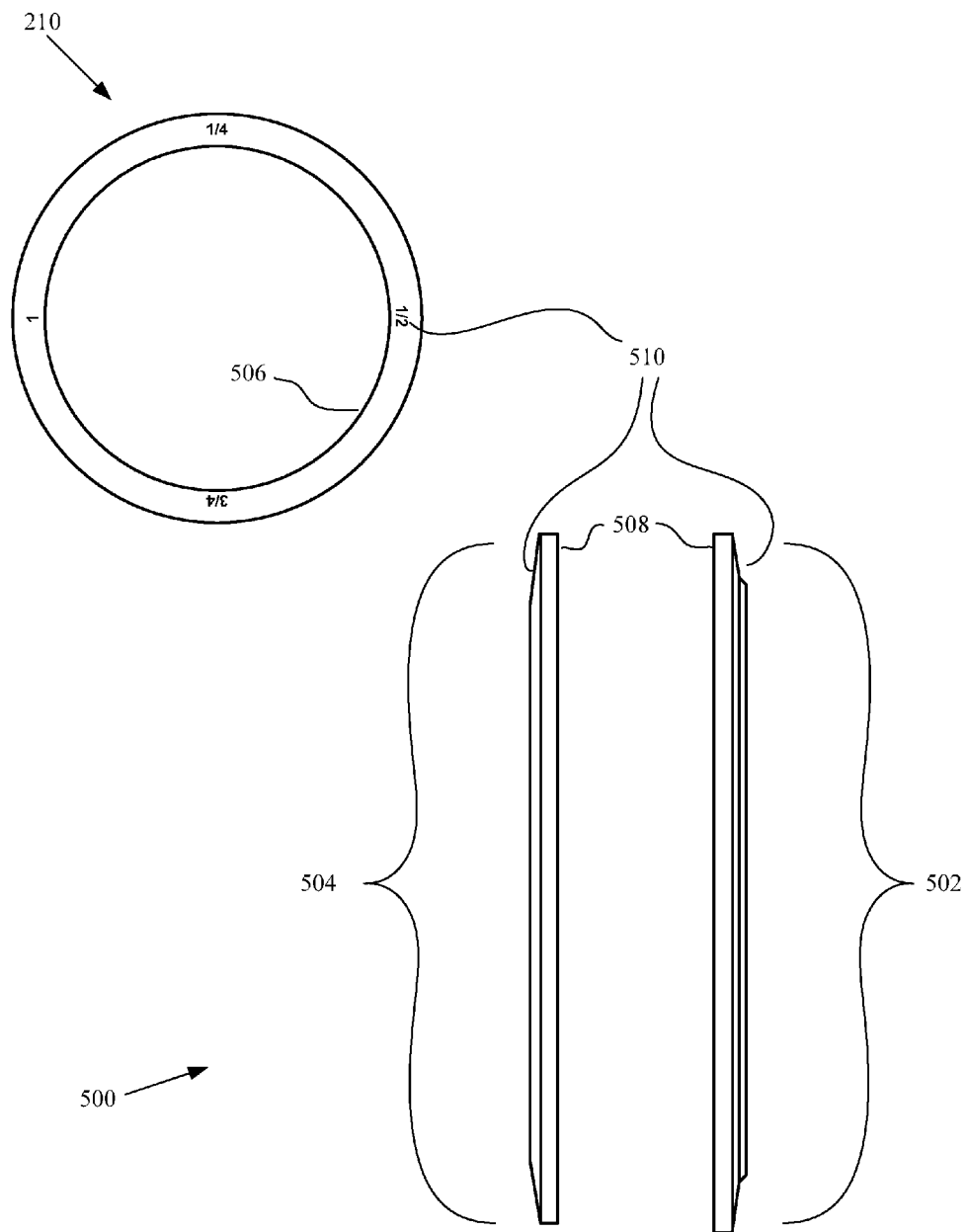


FIG. 5

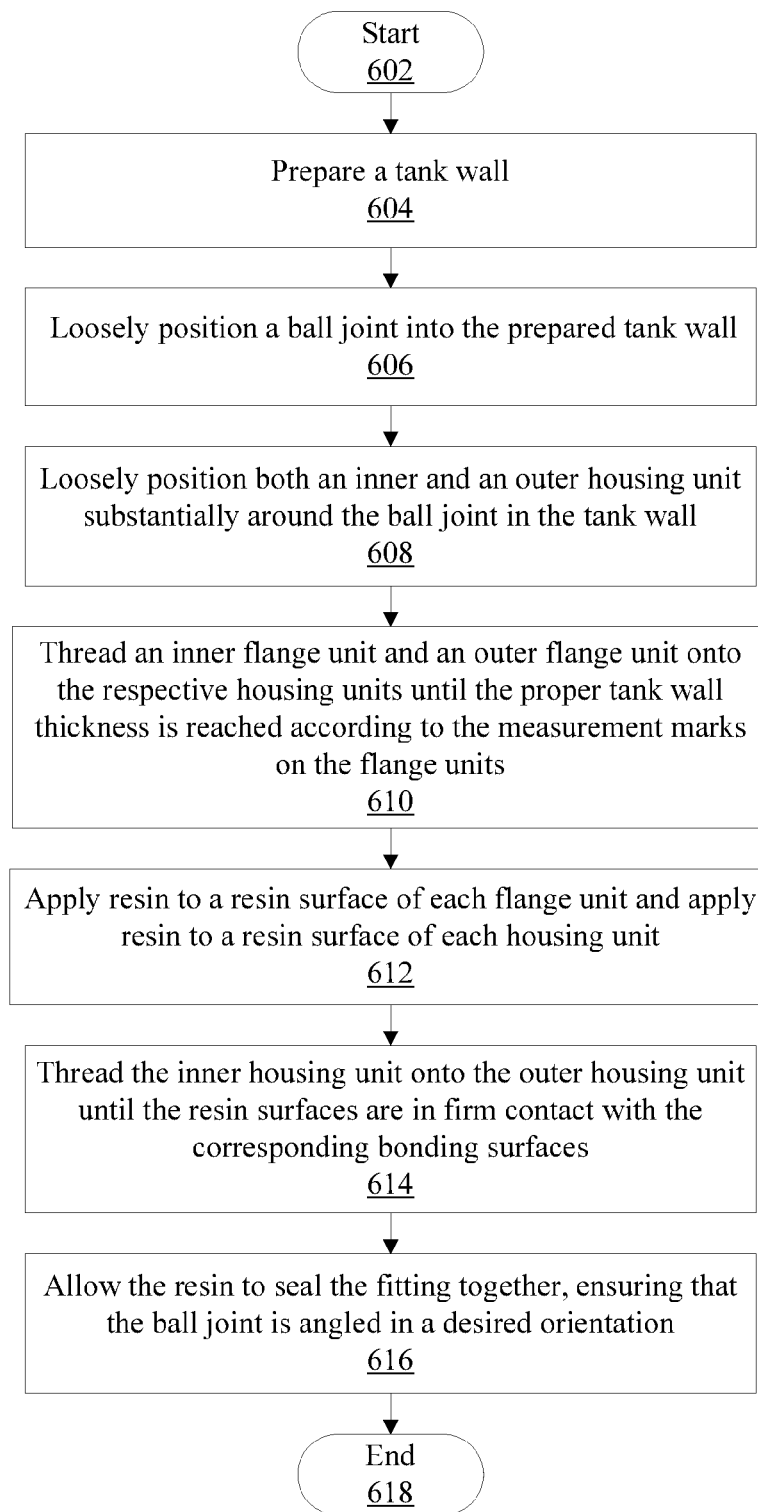


FIG. 6

1

APPARATUS AND METHOD FOR A BALL JOINT FITTING ASSEMBLY

CROSS-REFERENCES TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Patent Application No. 61/541,927 entitled "APPARATUS AND METHOD FOR A BALL JOINT FITTING ASSEMBLY" and filed on Sep. 30, 2011 for Drew P. Henry, which is incorporated herein by reference.

FIELD

This present disclosure relates to fitting devices for tubes that extend through walls and the mounting devices thereof.

BACKGROUND

Numerous conventional fitting devices exist that provide a manner for sealing a tube or a pipe that extends through a wall. However, many applications require double conduit tubing, a fitting device that can penetrate a double walled tank, and flexibility during installation. For example, many applications would benefit from a fitting device that could pass a double conduit pipe through a tank wall at an angle. Conventional devices, however, fail to provide such a means for angling the tubing and therefore greatly restrict the ease of installation and severely limit the effective implementation of the fitting device. Further, conventional fitting devices fail to provide a spacing system for the inner and outer flanges of the fitting, thereby causing improper seating and sealing of the fitting device on the tank wall(s).

SUMMARY

From the foregoing discussion, it should be apparent that a need exists for an apparatus, system, and method that provides for double conduit piping to pass through a wall of tank. Beneficially, such an apparatus, system, and method would allow for a fitting that provides for double conduit piping to pass through a wall of a tank at an angle.

The subject matter of the present application has been developed in response to the present state of the art, and in particular, in response to the problems and needs in the art that have not yet been fully solved by currently available fittings. Accordingly, the present disclosure has been developed to provide an apparatus, system, and method for passing double conduit piping through a wall that overcome many or all of the above-discussed shortcomings in the art.

The present disclosure relates to an apparatus for extending a pipe through a wall. The apparatus includes a ball joint through which at least one pipe extends, an inner pipe, which extends through the ball joint and through which a fluid material may transfer, a housing unit, which substantially surrounds the ball joint and comprises resin bonding surfaces that seal the housing unit to the ball joint, and a flange unit, which affixes to the housing unit and comprises resin bonding surfaces that seal the flange unit to a wall.

The housing unit of the apparatus may also include both a first housing unit and a second housing unit. The flange unit may also comprise a first flange unit and a second flange unit. In one embodiment, the apparatus includes a measurement system for spacing apart the flange units according to the thickness of a wall. The angle between the longitudinal axis of the inner pipe and a line orthogonal to the wall through which the pipe extends is in the range of between about 0 and 20

2

degrees. In another example, the angle between the longitudinal axis of the inner pipe and a line orthogonal to the wall through which the pipe extends is about 15 degrees. The apparatus may also include an outer pipe which extends from the ball joint and has a comparatively larger diameter than the diameter of the inner pipe. The apparatus may also include an interstitial pipe space monitor that monitors the properties and condition of the space between the inner pipe and the outer pipe.

The present disclosure also relates to a ball joint system for extending a pipe through a wall. The system includes a fluid holding tank, a ball joint traversing a wall of the tank through which at least one pipe extends, an inner pipe, which extends through the ball joint and through which a fluid material may transfer, a housing unit, which substantially surrounds the ball joint and comprises resin bonding surfaces that seal the housing unit to the ball joint, and a flange unit, which affixes to the housing unit and comprises resin bonding surfaces that seal the flange unit to a wall.

The housing unit of the system may also include both a first housing unit and a second housing unit. The flange unit may also comprise a first flange unit and a second flange unit. In one embodiment, the system includes a measurement system for spacing apart the flange units according to the thickness of a wall. The angle between the longitudinal axis of the inner pipe and a line orthogonal to the wall through which the pipe extends is in the range of between about 0 and 20 degrees. In another example, the angle between the longitudinal axis of the inner pipe and a line orthogonal to the wall through which the pipe extends is about 15 degrees.

The system may also include an outer pipe which extends from the ball joint and has a comparatively larger diameter than the diameter of the inner pipe. The system may also include an interstitial pipe space monitor that monitors the properties and condition of the space between the inner pipe and the outer pipe. In one embodiment, the system may include an interstitial wall space monitor that monitors the properties and conditions of the space between the two wall layers.

Also included in the present disclosure are details relating to a method for installing tubing through a wall. The method includes forming a hole in a wall, placing a ball joint in the hole formed in the wall, wherein tubing may pass through the ball joint, loosely positioning a first and a second housing unit substantially around the ball joint, loosely threading a first flange unit on the first housing unit and a second flange unit on the second housing unit, applying a resin to a resin surface of each flange unit and applying a resin to a resin surface of each housing unit, threading the first and second housing units together and permanently bonding the resin surface of each housing unit to the ball joint, wherein the ball joint is angled in a desired orientation, and threading the first and second flange units towards the wall and permanently bonding the resin surface of each flange unit to the wall.

Reference throughout this specification to features, advantages, or similar language does not imply that all of the features and advantages that may be realized with the present disclosure should be or are in any single embodiment of the invention. Rather, language referring to the features and advantages is understood to mean that a specific feature, advantage, or characteristic described in connection with an embodiment is included in at least one embodiment of the subject matter disclosed herein. Thus, discussion of the features and advantages, and similar language, throughout this specification may, but do not necessarily, refer to the same embodiment.

Furthermore, the described features, advantages, and characteristics of the disclosure may be combined in any suitable manner in one or more embodiments. One skilled in the relevant art will recognize that the subject matter of the present application may be practiced without one or more of the specific features or advantages of a particular embodiment. In other instances, additional features and advantages may be recognized in certain embodiments that may not be present in all embodiments of the disclosure.

These features and advantages of the present disclosure will become more fully apparent from the following description and appended claims, or may be learned by the practice of the disclosure as set forth hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the advantages of the invention will be readily understood, a more particular description of the invention briefly described above will be rendered by reference to specific embodiments that are illustrated in the appended drawings. Understanding that these drawings depict only typical embodiments of the invention and are not therefore to be considered to be limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings, in which:

FIG. 1 depicts one embodiment of a ball joint fitting apparatus ("fitting") that can be used for extending a pipe through a wall;

FIG. 2 is one embodiment of a standard cross-sectional view of the fitting (pipes not depicted);

FIG. 3 is one embodiment of the standard cross-sectional view of a ball joint with two pipes attached;

FIG. 4 depicts one embodiment of a first housing unit and an second housing unit from both a standard view and a perspective view;

FIG. 5 depicts one embodiment of a first flange unit and a second flange unit from the standard view and also depicts the first flange unit from a view from within the tank looking along the length of the tubing; and

FIG. 6 is a schematic flow chart diagram illustrating one embodiment of a method for installing a ball joint fitting apparatus within a wall.

DETAILED DESCRIPTION

Reference throughout this specification to "one embodiment," "an embodiment," or similar language means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases "in one embodiment," "in an embodiment," and similar language throughout this specification may, but do not necessarily, all refer to the same embodiment.

Furthermore, the described features, structures, or characteristics of the invention may be combined in any suitable manner in one or more embodiments. In the following description, numerous specific details are provided. One skilled in the relevant art will recognize, however, that the invention may be practiced without one or more of the specific details, or with other methods, components, materials, and so forth. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the invention.

The schematic flow chart diagrams included herein are generally set forth as logical flow chart diagrams. As such, the depicted order and labeled steps are indicative of one embodiment of the presented method. Other steps and methods may

be conceived that are equivalent in function, logic, or effect to one or more steps, or portions thereof, of the illustrated method. Additionally, the format and symbols employed are provided to explain the logical steps of the method and are understood not to limit the scope of the method. Although various arrow types and line types may be employed in the flow chart diagrams, they are understood not to limit the scope of the corresponding method. Indeed, some arrows or other connectors may be used to indicate only the logical flow of the method. For instance, an arrow may indicate a waiting or monitoring period of unspecified duration between enumerated steps of the depicted method. Additionally, the order in which a particular method occurs may or may not strictly adhere to the order of the corresponding steps shown.

FIG. 1 depicts one embodiment of a ball joint fitting apparatus **100** ("fitting") that can be used for extending a pipe through a wall. In one embodiment, for example, the fitting **100** can be used in an underground gasoline storage tank. In such an application, the fitting creates a rigid and durable seal through which a pipe could extend outward from the tank. Additionally, the fitting **100** provides for a second pipe to extend outward from the wall of the tank, thus creating a double conduit pipeline (required in certain applications).

In the present disclosure, the terms pipe and tube will be used interchangeably, both referring to the channel through which the material contained within the tank will pass. The tank and the components of the fitting **100** may be constructed of durable plastic, carbon fiber, metal, fiberglass, or other suitable material recognized by those of skill in the art. The materials may also be selected according to the specifics of a given application.

FIG. 2 is one embodiment of a cross-sectional view of the fitting **100** (pipes not depicted) positioned in a tank wall **202, 204**. At the center of the fitting **100** is a ball joint **302** through which the pipes extend and around which two housing units **402, 404** are positioned. There are also two flanges **502, 504** that circumscribe the two housing units **402, 404**, said flanges are used to attach and seal the fitting **100** onto an inner tank wall **202** and an outer tank wall **204**. In one embodiment the fitting **100** may be used to extend pipes through a single wall and in another embodiment the fitting **100** may be used to extend pipes through a tank with a double wall **202, 204** (as depicted in FIG. 2).

The fitting **100** further provides a wall monitoring port **206** through which a device can be securely inserted to monitor an interstitial wall space **208** and report any leaks or defects that may occur between the two walls **202, 204**. The wall monitoring port **206** does not compromise the overall seal of the fitting **100** because the monitoring device is firmly affixed within the wall monitoring port **206** to ensure a complete and robust seal. The interstitial wall space **208** is in fluid communication with the space **203** between the two walls **202, 204** because the housing units **402, 404** are not attached to one another via an air-tight seal. Therefore, the device within the wall monitoring port **206** can check the condition of the interstitial wall space **208**, which is representative of the condition between the two walls **203**.

In one embodiment, a pressure sensor may be placed within the wall monitoring port **206** to check for pressure changes between the walls of the tank. If the inner wall **202** were to fail or be defective in some way, the product contained within the tank would leak into the space **203** between the walls, thereby changing the pressure within the interstitial wall space **208** and the pressure sensor would alert the user of the condition. In another embodiment, the space **203** between the walls are maintained at a certain pressure; therefore if the outside wall **204** were to develop a structural weakness, the

5

pressure would be affected in the interstitial wall space **208** and the pressure sensor would communicate the evidence of such a defect to the user. In yet another embodiment, the wall space **203** may be filled with a fluid and the wall monitoring port **206** may be calibrated to detect any changes in the composition or pressure of the fluid, thereby alerting the user of a defect in the walls. It is contemplated that other monitoring systems, recognized by those of ordinary skill in the art, may be used in the present disclosure.

The cross-sectional view **200** of the fitting **100** also shows resin surfaces **410** on the housing units **402, 404** and the corresponding outer surface of the ball joint **302** upon which the resin surfaces **410** will attach. Although a more detailed description of the housing resin surfaces **410** is included below with reference to FIG. 4, the cross-sectional view **200** of the fitting **100** favorably shows the interface where resin bonding will occur. Also depicted in FIG. 2 is an arrow marking a view **210** from inside the tank looking down the length of the tubing that will be used below with reference to FIG. 5.

The ball joint fitting **100** permits the installer to angle the pipe that extends out from the tank in order to facilitate alignment with subsequent pipeline components. In one embodiment, the pipe affixed to the ball joint **302** extending out from the tank wall may have an angled position **212** of up to about 20 degrees. For example, if several underground storage tanks were to be connected in series, the present disclosure would provide for the fittings to be angled in such a manner as to make future pipeline connections easier to perform. Also, the present disclosure provides a spacing system whereby an installer can accurately seal the fitting in the wall of the tank according to the wall thickness. A more detailed explanation of the benefits of the present disclosure is described in detail below with reference to FIGS. 3-6.

FIG. 3 depicts one embodiment of a cross-sectional view **300** of a ball joint **302** with two pipes **304, 306** attached. In one embodiment, the ball joint **302** is manufactured in such a manner that an inner tube **304** is permanently bonded to the ball joint **302**. In another embodiment, the inner tube **304** may be resin bonded to the ball joint **302** just prior to installing the fitting **100** into the tank wall. Also depicted is an outer tube **306** which may be either permanently bonded to the ball joint **302** during manufacture or resin bonded to the ball joint **302** on site. In the present disclosure, the phrase "resin bonding" refers to an industrial strength adhesive process that permanently and rigidly affixes two surfaces to one another. It is contemplated that a suitable resin may be a polymer, plastic or epoxy material or other adhesive recognized by those of ordinary skill in the art.

The outer tube **306** is not in fluid communication with the material passing through the inner tube **304** but is positioned around the inner tube **304** so as to protect the inner tube **304** from puncture, penetration, deterioration or other damage. The outer tube **306** also isolates the contents of the inner tube **304** so as to reduce the likelihood that the contents of the inner tube **304** leak out into the surrounding environment. The ball joint **302** also includes a tube monitoring port **308** and an interstitial tube space **310**. A monitoring device may be securely inserted into the tube monitoring port **308** to check the status and conditions within the interstitial tube space **310**. The inserted device will not compromise the integrity of the seal because the device will be firmly affixed within the tube monitoring port **308**.

In one embodiment, a pressure sensor may be placed within the tube monitoring port **308** to check for pressure changes in the annular space between the inner and the outer tube. In another embodiment, the annular space between the

6

tubes is maintained at a certain pressure and the pressure sensor checks for any pressure changes. In yet another embodiment, the interstitial tube space **310** is filled with a fluid and the tube monitoring port **308** contains a device that is calibrated to detect any changes in the composition or pressure of the fluid. It is contemplated that other monitoring systems, recognized by those of ordinary skill in the art, may be used in the present disclosure.

FIG. 4 depicts one embodiment of both a side view **400** and a perspective view **401** of the first housing unit **402** and the second housing unit **404**. As depicted, a portion of the first housing unit **402** has a comparatively larger diameter than a portion of the diameter of the second housing unit **404**. The first housing unit **402** has an internal threaded surface **406** and an external threaded surface **407**. The second housing unit **404** has a single threaded surface **408** that is wider than the threaded surfaces **406, 407** of the first housing unit **402**. Therefore when the housing units **402, 404** are placed around the ball joint **302** in preparation for installation, the first housing unit **402** connects to the second housing unit **404** via mechanical threading. As mentioned above with reference to FIG. 2, the mechanical connection created by threading the two housing units together is not an air-tight seal and allows for the space between the walls **202, 204** to be in fluid connection with the interstitial wall space **208**.

Also depicted in FIG. 4 are the resin surfaces **410** of the housing units **402, 404**. Such surfaces **410** are located on the inside of the housing units **402, 404** and, prior to installing the fitting **100** into the tank wall, a resin adhesive is applied to the resin surfaces **410**. In one embodiment, the width of the resin surfaces **410** is in the range of between about 0.125 inches and 3 inches. In another embodiment, the width of the resin surfaces **410** is in the range of between about 0.5 inches and 2 inches. In yet another embodiment, the width of the resin surfaces **410** is about 1.0 inch.

The resin surfaces **410** of the housing units **402, 404**, upon installation of the fitting **100**, bond to the outer surface of the ball joint **302**. The orientation of this resin bond between the housing units **402, 404** and the ball joint **302** provides installation flexibility so that the pipes can extend outward from the tank wall at various angles. In one embodiment, the ball joint **302** may be oriented and sealed in such a way so that the tubing extends substantially orthogonal from the face of the tank wall. In another embodiment, the ball joint **302** may be oriented and sealed in such a manner so that the tubing extends through the tank wall at an angle of up to 20 degrees. Because the fitting **100** provides for this installation flexibility, planning for and aligning subsequent connections to the tubing will be less complicated and less demanding.

FIG. 5 depicts one embodiment **500** of a side view of a first flange unit **502** and a second flange unit **504** and also depicts the first flange unit **502** from a view **210** from within a tank looking along the length of the tubing. The second flange unit **504** is substantially similar to the first flange unit **502** because both flanges **502, 504** have a threaded surface **506** and a resin surface **508**. The resin surfaces **508** are the flat surfaces on the flange units **502, 504** that face towards each other on the assembled fitting **100** and that eventually bond with the tank walls (**202, 204** from FIG. 2). The threaded surfaces **506** are the thin inner surfaces of the inner diameter of the flange units **502, 504** that mechanically attach to the threaded surfaces **406, 407** of the housing units **402, 404**. For example, once the first housing unit **402** and the second housing unit **404** are mechanically connected to each other about the ball joint **302**, the threaded surface **506** of the first flange unit **502** may be threaded onto the external threaded surface **407** of the first housing unit **402** and the threaded surface **506** of the second

flange unit **504** may be threaded onto the threaded surface **408** of the second housing unit **404**.

Both flange units **502**, **504** also include measurement marks **510** on the faces of the respective flange units that are opposite of the resin surfaces **508**. Such measurement marks **510** are used as part of a wall thickness spacing system. The person installing the fitting **100**, after ascertaining the wall thickness of the tank, need only mechanically thread the flange units **502**, **504** as far onto the respective housing units **402**, **404** as indicated by the measurement marks. By so doing, the fitting **100** will be accurately and securely seated against the tank walls and the resin coated surfaces of the flange units **502**, **504** will bond with the tank walls to create a rigid and permanent seal. In one embodiment, the measurement marks display wall thickness ranges of between about 0.375 inches and 1.0 inch.

FIG. 6 is a schematic flow chart diagram **600** depicting one embodiment of a method for installing a ball joint fitting apparatus **100** within a wall. The method starts **602** by preparing **604** a tank wall for the fitting **100** installation. A circular hole may be drilled into the tank wall that is just wide enough to loosely position **606** a ball joint **302** into the prepared tank wall. The method continues by loosely positioning **608** both a first housing unit **402** and a second housing unit **404** substantially around the ball joint **302** within the tank wall.

The method continues by threading **610** a first flange unit **502** and a second flange unit **504** onto the respective housing units **402**, **404** until the proper tank wall thickness is reached according to the measurement marks **510** on the flange units **502**, **504**. For example, at this point in the method a hole has been drilled into the tank wall and the ball joint **302** is loosely housed within the housing units **402**, **404**, and the housing units are loosely positioned within the prepared hole in the wall. Also, the flange units **502**, **504** have been threaded onto the respective housing units **402**, **404** until the proper wall thickness is identified on the measurement marks **510**.

The method continues by applying **612** a resin to the resin surfaces **410**, **508** of the housing units **402**, **404** and the flange units **502**, **504** and then threading **614** the first housing unit **402** onto and around the second housing unit **404** until the resin surfaces are firmly pressed against the respective bonding surfaces. The type and amount of resin to be applied to the resin surfaces is application specific and it is contemplated that one of ordinary skill in the art is capable of making such determinations.

For example, in one embodiment an epoxy based resin may be used as the bonding agent. The installer first mixes together the two separate epoxy resins to activate their adhesive properties, after which the activated epoxy is spread evenly over the resin surfaces **410**, **508** of the housing units **402**, **404** and the flange units **502**, **504**. With the epoxy coating the resin surfaces, the first housing unit **402** may be threaded onto the second housing unit **404** until the housing resin surfaces **410** become firmly pressed against the ball joint **302** and the flange resin surfaces **508** are firmly pressed against the tank walls. The ball joint **302** must be oriented according to the desired angle of the tubing that will extend through the wall of the tank. The resin is then allowed **616** time to dry and the method ends **618** once the fitting **100** and its components have been rigidly sealed to one another and the fitting **100** has been rigidly sealed to the tank walls.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the disclosure is, therefore, indicated by the appended claims

rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed is:

1. An apparatus for extending a pipe through a wall, the apparatus comprising:

- a ball joint;
- an inner pipe, which extends through the ball joint and through which a fluid material may transfer;
- an outer pipe which extends from the ball joint, the outer pipe comprising a comparatively larger diameter than the diameter of the inner pipe, wherein an annular space is formed between the inner pipe and the outer pipe;
- a housing unit, which substantially surrounds the ball joint and comprises resin bonding surfaces that seal the housing unit to the ball joint; and
- a flange unit, which affixes to the housing unit and comprises resin bonding surfaces that seal the flange unit to a wall.

2. The apparatus of claim 1, wherein the housing unit comprises both a first housing unit and a second housing unit.

3. The apparatus of claim 1, wherein the flange unit comprises both a first flange unit and a second flange unit.

4. The apparatus of claim 3, further comprising a measurement system for spacing apart the flange units according to the thickness of a wall.

5. The apparatus of claim 1, wherein the angle between the longitudinal axis of the inner pipe and a line orthogonal to the wall through which the pipe extends is in the range of between about 0 and 20 degrees.

6. The apparatus of claim 1, wherein the angle between the longitudinal axis of the inner pipe and a line orthogonal to the wall through which the pipe extends is about 15 degrees.

7. The apparatus of claim 1, further comprising an interstitial pipe space monitor that monitors the properties and condition of the space between the inner pipe and the outer pipe.

8. A ball joint system comprising:

- a fluid holding tank comprising a wall;
- a ball joint traversing the wall of the tank;
- an inner pipe, which extends through the ball joint and through which a fluid material may transfer;
- an outer pipe which extends from the ball joint, the outer pipe comprising a comparatively larger diameter than the diameter of the inner pipe, wherein an annular space is formed between the inner pipe and the outer pipe;
- a housing unit, which substantially surrounds the ball joint and comprises resin bonding surfaces that seal the housing unit to the ball joint; and
- a flange unit, which affixes to the housing unit and comprises resin bonding surfaces that seal the flange unit to a wall of the fluid holding tank.

9. The system of claim 8, wherein the housing unit comprises both a first housing unit and a second housing unit.

10. The system of claim 8, wherein the flange unit comprises both a first flange unit and a second flange unit.

11. The system of claim 8, further comprising a measurement system for spacing apart the flange units according to the thickness of a wall.

12. The system of claim 8, wherein the angle between the longitudinal axis of the inner pipe and a line orthogonal to the wall through which the pipe extends is in the range of between about 0 and 20 degrees.

13. The system of claim 8, wherein the angle between the longitudinal axis of the inner pipe and a line orthogonal to the wall through which the pipe extends is about 15 degrees.

9

14. The system of claim 8, further comprising an interstitial pipe space monitor that monitors the properties and condition of the space between the inner pipe and the outer pipe.

15. The system of claim 8, wherein the wall of the fluid holding tank comprises two layers.

16. The system of claim 15, further comprising an interstitial wall space monitor coupled to the housing unit that monitors the properties and conditions of the space between the two wall layers.

17. The system of claim 16, wherein the interstitial wall space monitor coupled to the housing unit also monitors the properties and condition of the annular space between the inner pipe and the outer pipe.

18. An apparatus for extending a pipe through a wall, the apparatus comprising:

a ball joint comprising a central channel, wherein an inner pipe is extendable through the central channel and an outer pipe is extendable from the ball joint, wherein the

10

outer pipe has a comparatively larger diameter than the diameter of the inner pipe, wherein an annular space is formed between the inner pipe and the outer pipe;

a housing unit, which substantially surrounds the ball joint and comprises resin bonding surfaces that seal the housing unit to the ball joint; and

a first flange unit and a second flange unit that each comprise resin bonding surfaces configured to seal to a wall, wherein the first flange unit is threadably coupleable to the first housing unit and the second flange unit is threadably coupleable to the second housing unit.

19. The apparatus of claim 18, wherein the housing unit comprises a first housing unit and a second housing unit that each comprise resin bonding surface configured to seal to an exterior surface of the ball joint, wherein the first housing unit and the second housing unit are coupled together via non air-tight threads.

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